

UMATILLA RIVER BASIN TRAP & HAUL PROGRAM

ANNUAL REPORT 1993

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ABSTRACT

Threemile Falls Dam (Threemile Dam), located near the town of Umatilla, is the major counting and collection point for adult salmonids returning to the Umatilla River. Returning salmon and steelhead were collected at Threemile Dam from October 23, 1992 to July 14, 1993. A total of 1,913 summer steelhead (Oncorhynchus mykiss); 239 adult and 64 jack fall chinook (O. tshawytscha); 355 adult and 174 jack coho (O. kisutch); and 1,205 adult and 16 jack spring chinook (O. tshawytscha) were collected. All fish were trapped at the east bank facility with the exception of 17 summer steelhead which were trapped at the west bank facility. Of the fish collected, 1,528 summer steelhead; 38 adult and two jack fall chinook; 280 adult and 26 jack coho; and 1,043 adult and four jack spring chinook were hauled upstream from Threemile Dam using either a 370 or 3,000 gallon liberation unit. There were also 93 summer steelhead; 47 fall chinook jacks; 62 adult and 142 jack coho; and nine spring chinook adults released at Threemile Dam. In addition, 220 summer steelhead and 199 adult and 11 jack fall chinook were hauled to Minthorn for brood.

The Westland Canal facility, located near the town of Echo, is the major collection point for outmigrating juvenile salmonids and steelhead kelts. The facility was in operation from February 15 to July 29, 1993. During that period, fish were bypassed back to the river 119 days and were trapped 46 days. An estimated 3,228 pounds of fish were transported from the Westland Canal trap to the Umatilla River boat ramp at rivermile (RM) 0.5. Approximately 89% of the fish transported this year were salmonids.

The Threemile Dam west bank juvenile facility was in operation from April 7 to July 26, 1993. The facility operated in the bypass mode the entire period.

INTRODUCTION

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and Oregon Department of Fish and Wildlife (ODFW) are cooperatively working to rehabilitate runs of coho, fall and spring chinook and summer steelhead in the Umatilla River Basin (Figure 1). Bonneville Power Administration..(BPA) and other federal agencies are funding several projects to accomplish that goal (ODFW 1986). Included among these projects is the Umatilla River Trap and Haul Program (Fish and Wildlife Program measure 1403 [4.21]).

Releases of juvenile salmon and steelhead into the Umatilla River have increased from 27,000 in 1981 to a peak of 6,365,000 in 1992. An estimated 5,650,000 juvenile salmon and steelhead will be released into the Umatilla River in 1993 and long range production goals call for releasing up to 8,950,000 (CTUIR and ODFW 1989). In addition to increases in artificial production, restoration and rehabilitation projects in the upper basin are expected to have a positive impact on natural production. Although adult returns to the Umatilla River in 1992-93 reached only 4,000 fish, the long range goal for the Umatilla River is for a combined, all species return of 40,000 adult salmonids (CTUIR and ODFW 1989).

The lower 30 miles of the Umatilla River provides an obstacle to migration of both adult and juvenile salmonids during low flow periods. During the juvenile outmigration and adult return periods, parts of the lower river between Threemile Falls and Stanfield Dams can be dewatered, stranding migrating salmon. Flows of 150 cfs have been hypothesized to be the minimum needed for fish passage through the lower 30 miles of river (USFWS 1981). Fish passage improvement and flow enhancement projects are intended to improve this problem. In conjunction with these passage improvement and flow enhancement projects, the Umatilla River Trap and Haul Program has been implemented to assist fish passage.

The goal of the Trap and Haul program is to maximize survival of adult and juvenile salmonids in the lower 30 miles of river by providing safe transportation around this heavily diverted stretch of river and by developing guidelines for operating fish passage and flow improvement projects currently being implemented to help facilitate adult and juvenile fish migration.

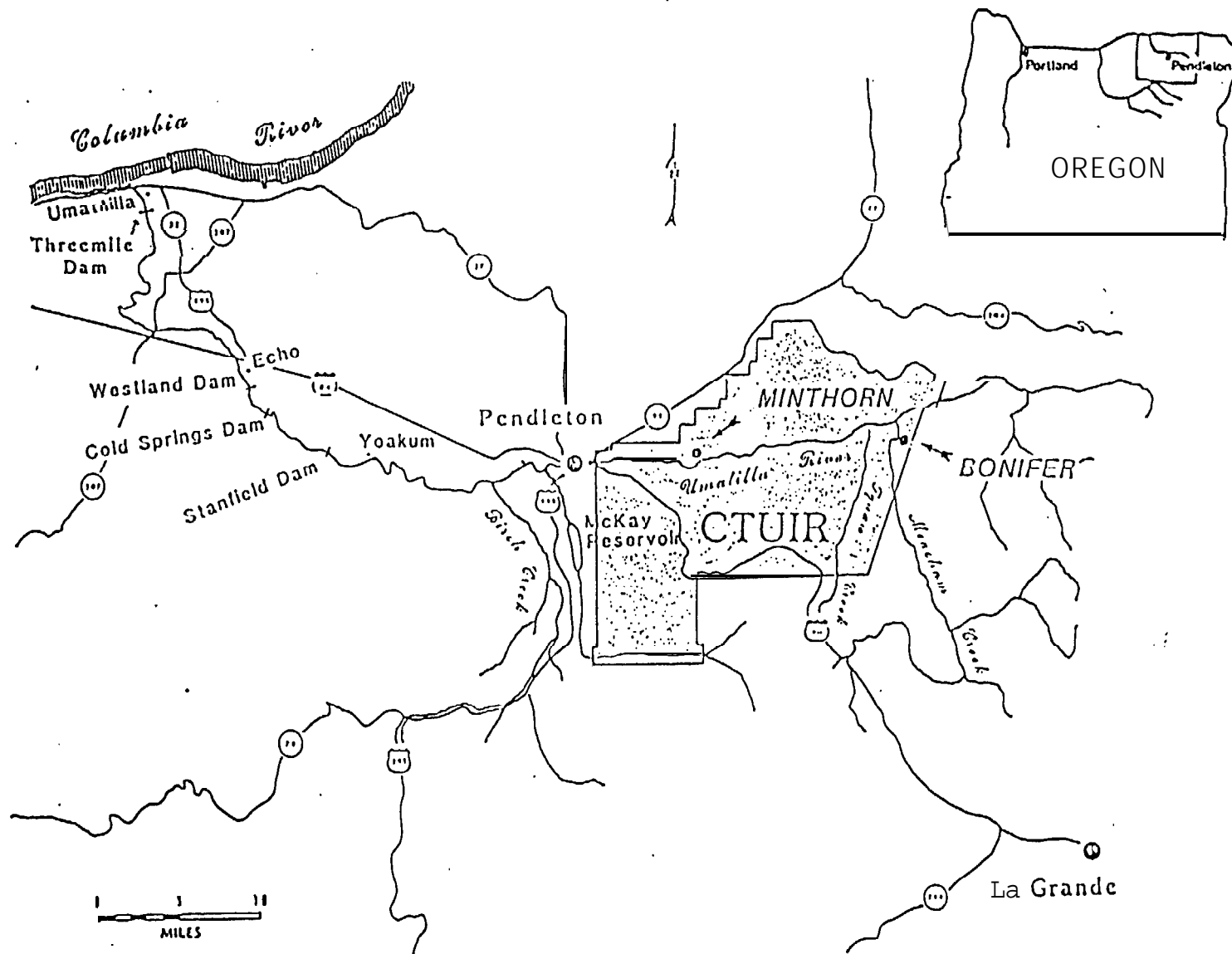


Figure 1. Umatilla River Basin.

METHODS

Monitoring

Temperatures were monitored during the project year to help in establishing operating guidelines for future trap and haul operations. Temperatures were measured daily at Threemile Dam by use of a Ryan TempMentor digital recording thermometer and at loading stations and release sites with hand held thermometers.

Daily river flow was monitored at Pendleton (RM 54), Yoakum (RM 37), Echo (RM 26) and Umatilla (RM 2). Flow data from Pendleton and Yoakum were provided by the Oregon Department of Water Resources (OWRD) and flow information from Umatilla was obtained from Bureau of Reclamation (BR) operational data. The estimated flow at Echo was derived by subtracting irrigation withdrawals at Stanfield (RM 32.5), Cold Springs (RM 28) and Westland (RM 27) canals from the Umatilla River flow reading at Yoakum gauge (RM 37). Irrigation withdrawal information was provided by Stanfield-Westland (SWID) and Hermiston (HID) irrigation districts.

Juvenile fish screens and adult ladder facilities located at five major irrigation diversions and at seven smaller diversions were monitored on a weekly basis throughout the year to ensure adequate passage conditions for both upstream and downstream migrants. Inspections included checking for proper installation and operation of drum screens, gaps and holes in drum screens and seals, debris on drum screens and ladder trash racks, proper flow and access to smolt bypasses, proper attraction flows and access to fish ladders and signs of fish activity.

Adult Trappings Facilities and Operations

Threemile Dam, located approximately three miles upstream from the mouth of the Umatilla River, is the major counting and collection point for all adults returning to the Umatilla River. The main collection facility is located on the east bank and includes a vertical slot ladder, Denil steep pass, raceway type holding pond and fish handling and sorting complex (Figures 2 and 3). The capability exists to anesthetize all fish and all returning adults are to be anesthetized with carbon dioxide (CO₂). Captured adults can be directed back into the holding pond, into recovery tanks for release upstream of the dam, directly into the dam forebay or into transport tanks for hauling.

Data collected during adult trapping operations include date, number of fish trapped, species, age and sex composition, marks and disposition. In addition, fork length, mid-eye/hypural plate (MEHP) length, scales and snouts were collected from a portion of the fish with coded wire tags (CWT).

FLOW

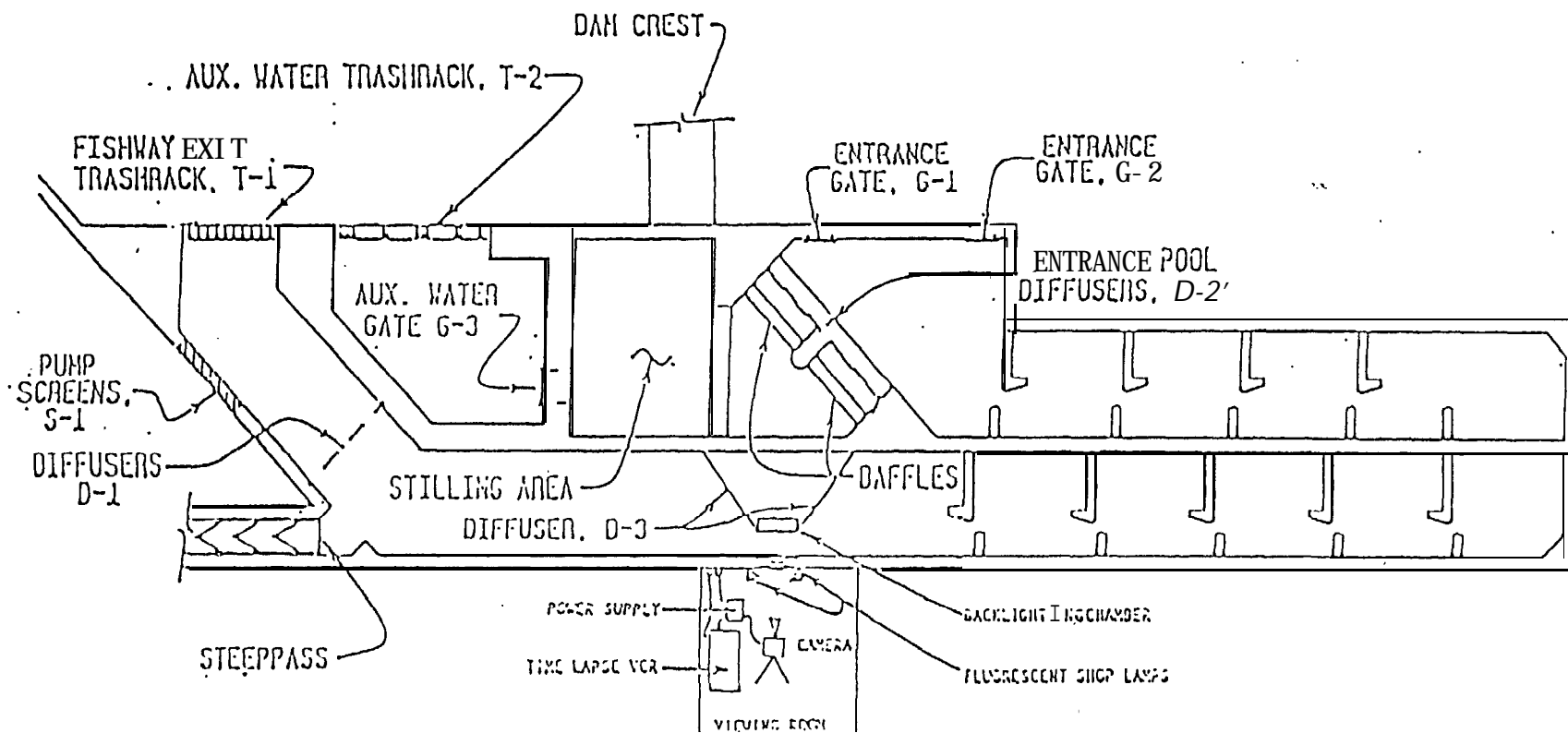


Figure 2. Three mile Dam Right Bank Fishway.

MODIFIED BY C.T.U.I.R. JULY 1970

NATIONAL MARINE FISHERIES SERVICE

3 - MILE DAM
RIGHT FISHWAY

DESIGNED BY: S.M.
DRAWN BY: G.A.J.J.

DATE: 1-5-00 PAGE:
SCALE: NONE OF:

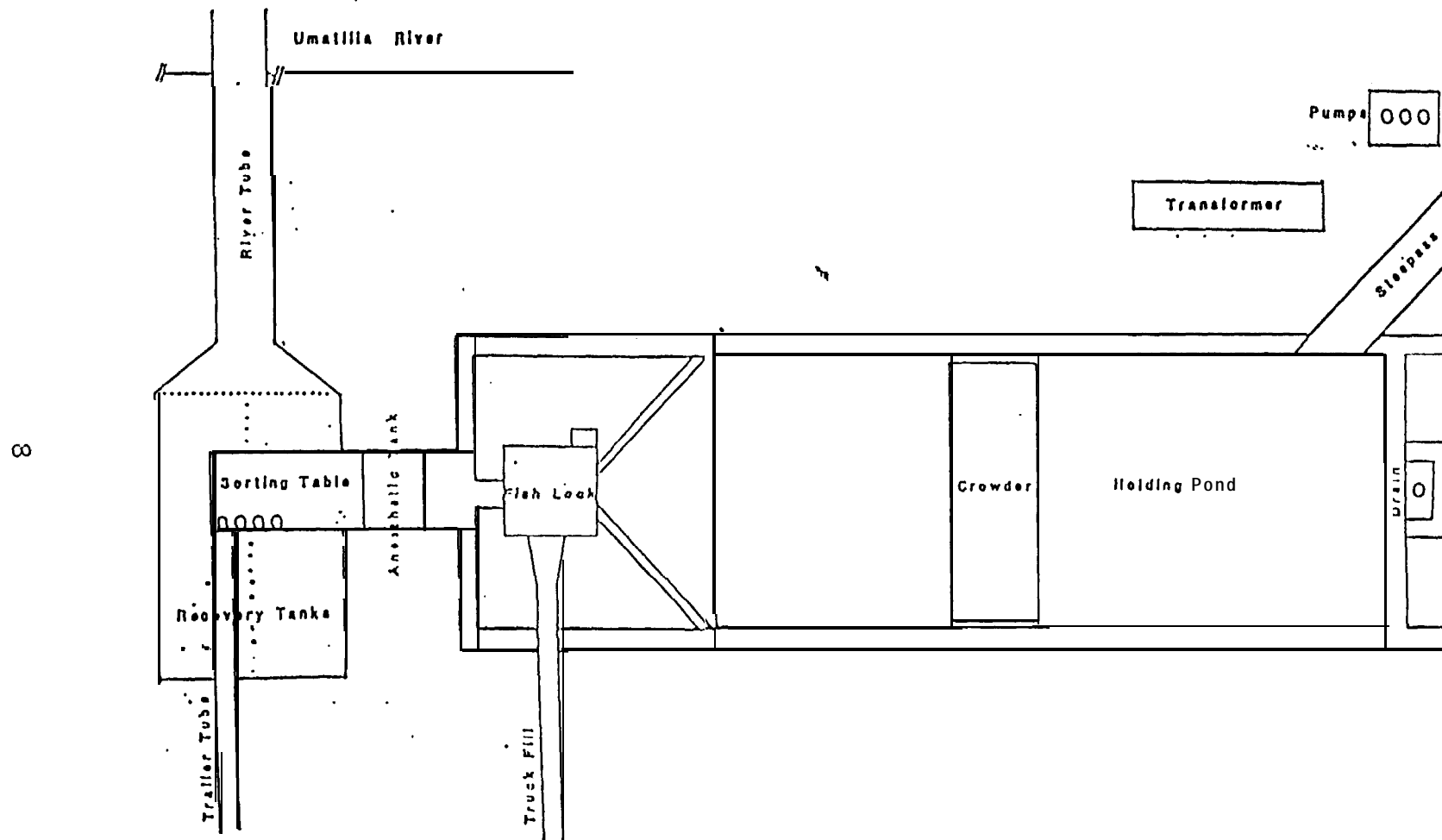


Figure 3. Overhead View of Three mile Dam Right Dank Trapping Facility.

Fall chinook were classified as either adults (fork length greater than or equal to 24 inches) or jacks (fork length less than 24 inches) based on ODFW sport fishing regulations. Subjack (or mini-jack) fall chinook were defined as less than 15 inches in fork length based upon historical length frequency data (CTUIR files). Spring chinook were classified as 3 year old jacks (less than 24 inch fork length), 4 year olds (24 to less than 31 inch fork length) or 5 year olds (greater than or equal to 31 inch fork length). These spring chinook age/length classifications were based upon scale analysis data collected at Bonneville Dam (Schwartzberg and Fryer 1990). Coho adults (3 years old) were defined as fork length greater than or equal to 18 inches and jacks (2 years old) as fork length less than 18 inches based upon historical length frequency data (CTUIR files). Based on scale analysis of Umatilla River summer steelhead, adult summer steelhead were classified as either one ocean (S1, fork length less than 26 inches) or two ocean (S2, fork length greater than or equal to 26 inches) (CTUIR files). Visual determinations were made to differentiate summer steelhead from resident rainbow trout (but generally less than 18 inches). No data was collected from fish designated as resident trout.

The east bank facility was to be manned 24 hours a day during the adult capture season. However, due to damage sustained to the BPA trailer in the off season, watch personnel were not stationed on-site until February. In addition to providing security, watch personnel monitored facility operations, assisted in trap and haul operations and made observations of fish activity.

The west bank at Threemile Dam also has an adult collection facility (Figure 4). It consists of a vertical slot ladder, a combination V-trap/holding pond and fish loading apparatus. The trap/holding pond and fish *loading complex have no enumeration or sorting capabilities. The ladder was designed with the ability to enumerate fish using video equipment. The main effort of trap and haul operations in 1992-93 took place at the east bank facility with the west bank facility being operated for evaluation only.

The Westland facility, located near Echo (RM 27), is the capture point for outmigrating summer steelhead kelts. The facility is designed to either bypass kelts directly back to the river or to trap them. Kelts entering the trap are separated from juveniles by a horizontal bar grader and then proceed into an adult holding pond. Kelts can then be loaded into tanks for hauling downstream.

Juvenile Trapping Facilities and Operations

The Westland facility (Figure 5) is the major collection point for outmigrating juvenile salmonids. It is intended to be operated whenever Westland Canal is in operation. The facility consists of rotary drum screens, fish bypass, fish trap, adult/juvenile separator (horizontal bar grader), and adult and juvenile holding ponds. During periods of flow high enough to facilitate downstream

migration, the facility is designed to operate in the bypass mode. In this mode, fish that enter the irrigation canal are shunted directly back to the river without entering the holding ponds. During periods of low flow the facility is designed to trap fish, separate adults and juveniles, and direct them to their respective holding unit. Juveniles and adults can then be loaded onto trucks or trailers for transport downstream.

Data collected by Trap and Haul personnel at Westland included dates of operation in the bypass and trapping modes as well as date, hauling unit, number of pounds hauled and an estimate of transport mortality for each trip. Bonifer/Minthorn personnel collected other information related to smolt outmigration such as size and species composition.

Westland was manned on a 24 hour basis from April 1 through the end of June. A trailer was provided by BPA for on-site housing and personnel were involved with the same general activities as watch personnel at Threemile Dam east bank.

A juvenile collection facility is also located at Threemile Dam west bank (Figure 4). It is designed to either bypass out-migrating juveniles during periods of adequate flow or to trap them during low flow periods. This facility consists of rotary drum screens, fish bypass channel, fish trap, sampling station and holding tote. The trapping portion of this facility was designed as a sampling and evaluation station rather than a production trap and haul facility.

Transportation Equipment and Operations

The Trap and Haul program has one 3,000 gallon and two 370 gallon fish liberation units. The 3,000 gallon unit is a diesel operated tractor-trailer equipped with two holding chambers capable of transporting juveniles and adults in the same load. The unit is also equipped with both liquid oxygen and electric aeration to reduce fish stress during transport. The two 370 gallon fish tank trailers tanks are mounted on dual axle trailers and are pulled by pick-up trucks. Each unit is equipped with compressed oxygen aeration and re-circulation systems.

A Pescalator fish pump (manufactured by P.R.A. MFG.) was purchased and stationed at Westland for loading juveniles captured at Westland trap.

Adult and juvenile transportation criteria for the project was based on the 1981 U.S. Fish and Wildlife study and past observations of salmon migrations in the Umatilla River. Release sites for both adults and juveniles were outlined in the Umatilla Basin Artificial Fish Production Plan (CTUIR and ODFW 1992).

Outmigrants (both juveniles and kelts) were to be hauled whenever flow conditions in the Umatilla River were projected to drop below 150 cfs at Echo within 10 days. Downstream migrants were to be released at the Umatilla boat ramp (RM 0.5) as long as flows remained above 50 cfs. At lower flows an alternate site (i.e. Columbia River) was to be used. ODFW liberation protocol was used as the basic guideline for juvenile hauling operations.

Returning fall chinook and coho hauled upstream were to be released at Barnhart. Spring chinook and summer steelhead were to be released in the same area until May 15 or unless flows at Pendleton dropped below 150 cfs. Releases were then to be alternated between Thornhollow (RM 73.5), Fred Gray's (RM 80), and Bear Creek (RM 87). All spring chinook released above Pendleton were given a differential mark (right opercle punch) to evaluate impact of release location on fallback and prespawn survival rates.

The Umatilla Basin Artificial Fish Production Plan (CTUIR and ODFW 1992) also identified groups to be released at Threemile Dam. These included fall chinook jacks and minijacks, excess coho adults and jacks, and radio tagged passage evaluation fish of all species. In addition, if flows at Echo were anticipated to remain above 150 cfs for a minimum of 30 days then summer steelhead were also to be released at Threemile Dam.

Trap and Haul personnel were also responsible for the collection and transportation of summer steelhead and fall chinook brood designated for Umatilla River production.

RESULTS

Monitoring

Water temperature and flow, measured at Threemile Dam, exhibited extreme seasonal fluctuation during the year (Appendix A). The lowest daily mean temperature recorded was -0.1 C (31.8 F) on January 13, 1993; the highest daily mean temperature was 22.5 C (72.5 F) on June 19 and 20. Flows at the Umatilla gauging station ranged from a low of less than 1 cfs in September and October to a high of over 9,000 cfs in May.

Umatilla River flow at Echo is affected by McKay Reservoir storage releases, irrigation withdrawals and natural flows (Appendix A). Estimated flows at Echo ranged from a low of 2 cfs in November to a high of 7,071 cfs in May. Flows at Yoakum ranged from 51 cfs to 7,446 cfs and flows at Pendleton ranged from 39 cfs to 6,454 cfs (Appendix A). There is some concern as to the accuracy of flows reported from the Yoakum and Pendleton gauges.

Monitoring of juvenile and adult passage facilities located at the five major irrigation diversions and seven smaller diversions uncovered numerous operational problems. Problems discovered included drum screens not in place, improper canal elevations, inadequate bypass exit conditions, improper bypass flows, inadequate ladder attraction flows and improper ladder access and exit conditions.

Cold Springs Canal turned on and off three times this spring. Small numbers of juvenile salmonids (less than 1,000) were found in the canal each time it was dewatered. Fish found between the headworks and juvenile screens were flushed directly back to the river through the bypass.

Adult Trapping Facilities and Operations

Threemile Dam east bank ladder opened on October 14, 1992 and the steppass and trap were opened on October 21. The facility ran continuously, with few exceptions, until July 26, 1993. The steppass and trap were inoperable from January 11 to January 19 because of ice. They were also off for nine days in March and seven days in May due to flood conditions. The ladder remained open the whole period. The Threemile Dam west bank ladder and trap were operated by fish passage personnel for evaluation purposes April 12 through April 16.

The first returning salmon and steelhead were collected on October 23. A total of 1,913 summer steelhead; 239 adult and 64 jack fall chinook; 355 adult and 174 jack coho; and 1,205 adult and 16 jack spring chinook were collected at Threemile Dam. No fall chinook minijacks were captured this year. Seventeen summer

steelhead were captured during the evaluation of the west bank, the rest were trapped at the east bank facility.

Summer steelhead were trapped from October 23, 1992 to May 28, 1993. Peak return occurred during April when 41.6% (796 of 1,913 fish) of the fish were trapped. Based on historical fork length data, 52.7% of the summer steelhead run was comprised of S1 fish and 47.3% were S2 fish.

Coho were trapped from October 23 to December 30, 1992. Peak return month for both adults and jacks was November. Of the total coho return, 83.9% (298 of 355 fish) of the adults and 81.0% (141 of 174 fish) of the jacks were trapped in November.

Fall chinook were trapped from October 23 to December 1, 1992. Peak return month for both adults and jacks was November. Of the total fall chinook return, 98.3% (235 of 239 fish) of the adults and 98.4% (63 of 64 fish) of the jacks were trapped in November.

Spring chinook were recovered from April 19 to July 14, 1993. Peak return month for both adults and jacks was May. Of the total spring chinook return, 78.5% (946 of 1,205 fish) of the adults and 75.0% (12 of 16 fish) of the jacks were trapped in May. Age class breakdown of the adult spring chinook recovered, based on fork length data, was 72.8% 5 year olds and 27.2% 4 year olds. Two confirmed fallbacks from the upper river were also recaptured but are not included in the trap count data.

Tables 1 through 4 contain a complete daily record of adults recaptured during 1992-93 including date, age class, marks, and disposition.

In addition to capturing adult salmonids, thousands of non-game fish were collected at the east bank facility during the trapping season. Major species collected were northern squawfish (Ptychocheilus oregonensis), chiselmouth (Acrocheilus alutaceus), large scale sucker (Catostomus macrocheilus) and bridgelip sucker (C. columbianus). Squawfish were sacrificed; all other non-game fish were released upstream of the dam. Juvenile salmonids also entered the adult trap and were released back to the river. Other species encountered at Threemile Dam were white sturgeon (Acipenser transmontanus), pacific lamprey (Entosphenus tridentatus), carp (Cyprinus carpio), and smallmouth bass (Micropterus dolomieu).

Juvenile Trapping Facilities and Operations

The Westland Canal juvenile facility was in operation from February 15 to July 29, 1993. The facility operated in the bypass mode for 119 days and in the trapping mode for 46 days. Excellent spring river flows allowed the facility to operate in the bypass mode until June 14.

Table 1.1 1992 Fall Chinook Return Disposition,

DATE	TRAPPED				SACRIFICED				RELEASED UPSTREAM			RELEASED @ DAM			BROOD		
	TOTAL	ADULTS	JACKS	MINI JACKS	TOTAL	ADULTS	JACKS	MINI JACKS	TOTAL	ADULTS	JACKS	TOTAL	JACKS	MINI JACKS	TOTAL	ADULTS	JACKS
10-27	1	0	1	a	0				0			1	1		0		
10-30	2	2	0	a	0				0			0			2	2	
10-30	1	1	0	a	0				1	1		0			0		
OCT	4	3	1	a	0	0	0	0	1	1	a	1	1	1	2	2	0
11-01	41	27	14	a	0				0			13	13		28	27	1
11-03	43	35	8	a	0				0			7	7		36	35	1
11-04	21	17	4	a	0				0			4	4		17	17	
11-05	17	14	3	a	0				0			1	1		16	14	2
11-06	27	21	6	0	0				0			4	4		23	21	2
11-08	32	26	6	0	0				0			3	3		29	26	3
11-09	34	28	6	0	0				0			6	6		28	28	
11-10	7	7	0	0	0				0			0			7	7	
11-11	3	2	1	0	0				0			0			3	2	1
11-13	9	8	1	0	0				0			0			9	8	1
11-16	42	32	10	0	0				24	22	2	8	8		0	10	
11-17	12	9	3	0	4	1	3		6	6		0			2	2	
11-18	1	1	0	0	0				1	1		0			0		
11-19	1	1	0	0	0				1	1		0			0		
11-20	3	3	0	0	1	1			2	2		0			0		
11-23	1	1	0	0	0				1	1		0			0		
11-24	4	3	1	0	1		1		3	3		0			0		
NOV	298	235	63	0	6	2	4	a	36	36	2	46	46	0	208	197	11
12-01	1	1	0	0	0				1	1		0			0		
DEC	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
TOTAL	303	239	64	0	6	2	4	0	40	58	2	47	47	0	210	199	11

Table 2. 1992 Coho Return Disposition.

DATE	TRAPPED			SACRIFICED			RELEASED @ DAM			RELEASED UPSTREAM		
	TOTAL	ADULTS	JACKS	TOTAL	ADULTS	JACKS	TOTAL	ADULTS	JACKS	TOTAL	ADULTS	JACKS
10-23	24	5	19	2		2	2	2		20	3	17
10-26	16	8	8	2	1	1	7	7		7		7
10-27	3	0	3	0			0			3		3
10-28	2	2	0	1	1		1	1		0		
10-30	4	2	2	0			4	2	2	0		
OCT	49	17	32	5	2	3	14	12	2	30	3	27
11-02	56	33	23	4	4		23	21	2	29	8	21
11-03	119	89	30	1		1	91	89	2	27		27
11-04	37	20	17	1		1	16	12	4	20	8	12
11-05	32	13	19	2	1	1	13	8	5	17	4	13
11-06	27	13	14	0			13	13		14		14
11-08	23	14	9	0			15	14	1	8		8
11-09	36	30	6	3	3		23	23		10	4	6
11-10	9	7	2	0			5	5		4	2	2
11-11	1	1	a	0			0			1	1	
11-13	25	23	2	1	1		19	17	2	5	5	
11-16	28	20	a	0			23	19	4	5	1	4
11-17	11	6	5	1	i		7	5	2	3		3
11-18	8	7	1	0			7	7		1		1
11-19	6	5	1	0			6	5	1	0		
11-20	8	6	2	0			6	6		2		2
11-23	2	1	1	0			2			0		
11-25	4	4	0	0			4	4		0		
11-27	2	2	0	0				1		1	1	
11-30	5	4	1	0			1	1		4	3	1
NOV	439	298	141	13	10	3	275	251	24	151	37	114
12-01	12	12	0	0			6	6		6	6	
12-02	8	8	0	0			2	2		6	6	
12-03	1	1	0	0			0			1	1	
12-14	2	2	0	0			0			2	2	
12-15	1	1	0	0			1	1		0		
12-17	1	1	0	0			0			1	1	
12-18	1	1	0	0			0			1	1	
12-24	6	6	0	0			2	2		4	4	
12-28	8	7	1	1	1		5	5		2	1	
12-30	1	1	0	0			1	1		0		
DEC	41	40	1	1	1	a	17	17	0	23	22	1
TOTAL	529	355	174	19	13	6	306	280	26	204	62	142

Table 3. 1992-93 Summer Steelhead Return Disposition.

DATE	TRAPPED			SACRIFICED			RELEASED UPSTREAM			RELEASED @ DAM			BROOD		
	TOTAL	HATCHERY	WILD	TOTAL	HATCHERY	WILD	TOTAL	HATCHERY	WILD	TOTAL	HATCHERY	WILD	TOTAL	HATCHERY	WILD
10-23	1	0	1	0			1		1	0			0		
OCT	1	0	1	0	0	0	1	0	1	0	0	0	0	0	0
11-02	3	0	3	0			3		3	0			0		
11-03	1	1	0	1	1		0			0			0		
11-04	2	1	1	0		1	2	1	1	0			0		
11-08	1	0	1	0			1		1	0			0		
11-09	1	0	1	0			1		1	0			0		
11-13	5	2	3	0			5	2	3	0			0		
11-16	6	0	6	0			0		6	0			0		
11-17	1	1	0	1	1		0			0			0		
11-23	1	0	1	0						0			1		1
11-30	3	1	2	0			2	1	1	0			1		1
NOV	24	6	18	2	2	0	20	4	16	0	0	0	2	0	2
12-01	1	0	1	0			1		1	0			0		
12-14	1	0	1	0			1		1	0			0		
12-15	1	1	0	0			0			1	1		0		
12-17	1	0	1	0			1		1	0			0		
12-18	1	0	1	0			1		1	0			0		
12-24	9	4	5	2	2		7	2	5	0			0		
12-28	11	3	8	0			7	3	4	2		2	2		2
12-30	3	0	3	0			3		3	0			0		
DEC	28	8	20	2	2	0	21	5	16	3	1	2	2	0	2
1-25	1	0	1	0			1		1	0			0		
1-26	1	0	1	0			1		1	0			0		
1-27	2	1	1	1	1		0			1		1	0		
1-28	5	2	3	1	1		3		3	1	1		0		
1-29	10	6	4	3	3		4		4	3	3		0		
JAN	19	9	10	5	5	0	9	0	9	5	4	1	0	0	0
2-01	93	23	70	8	8		62		62	15	15		8		8
2-02	12	4	8	0			8		8	4	4		0		
2-05	9	4	5	2	2		5		5	2	2		0		
2-08	40	11	29	5	5		29		29	6	6		0		
2-09	19	2	17	1	1		17		17	1	1		0		
2-10	2	0	2	0			2		2	0			0		
2-11	17	2	15	0			11		11	2	2		4		4
2-12	12	6	6	2	2		6		6	4	4		0		
2-14	5	0	5	0			0			0			5		5
2-16	15	4	11	2	2		11		11	2	2		0		
2-19	1	0	1	0			1		1	0			0		
FEB	225	56	169	20	20	0	152	0	152	36	36	0	17	0	17
3-05	24	4	20	0			20		20	3	3		1	1	
3-06	41	10	31	0			31		31	10	10		0		
3-08	36	11	25	0			15		15	6	5	1	15	6	9
3-09	6	1	5	0			5		5	1	1		0		
3-10	8	3	5	0			5		5	3	3		0		
3-11	19	6	13	0			13		13	6	6		0		
3-12	36	15	21	0			9		9	5	5		22	10	12
3-14	42	8	34	0			34		34	8	8		0		
3-15	59	26	33	0			46	13	33	0			13	13	
3-16	34	9	25	0			34	9	25	0			0		
3-17	40	6	34	0			39	5	34	1	1		0		
3-19	28	4	24	0			19	3	16	0			9	1	8
3-23	37	15	22	1	1		27	6	21	1		1	8	8	
3-24	19	10	9	0			18	10	8	1		1	0		
3-29	171	53	118	1		1	140	36	104	0			30	17	13
3-30	110	41	69	0			93	28	65	1	1		16	12	4
3-31	61	20	41	0			54	20	34	0			7		7
MAR	771	242	529	2	1	1	602	130	472	46	43	3	121	68	59

Table 3. (continued)

DATE	TRAPPED			SACRIFICED			RELEASED UPSTREAM			RELEASED @ DAM			BROOD		
	TOTAL	HATCHERY	WILD	TOTAL	HATCHERY	WILD	TOTAL	HATCHERY	WILD	TOTAL	HATCHERY	WILD	TOTAL	HATCHERY	WILD
4-01	97	34	63	0			83	26	57	0			14	8	6
4-02	157	47	110	1		1	122	33	89	0			34	14	20
4-03	50	4	46	0			50	4	46	0			0		
4-04	32	8	24	0			32	8	24	0			0		
4-05	9	4	5	4	4		5		5	0			0		
4-06	11	5	6	0			11	5	6	0			0		
4-07	21	5	16	0			21	5	16	0			0		
4-08	66	20	46	1	1		53	19	34	0			0		
4-09	49	19	30	3	3		46	16	30	0			12		12
4-11	18	4	14	0			18	4	14	0			0		
4-12	13	5	8	1	1		12	4	8	0			0		
4-13	29	13	16	2	2		26	10	16	1	1		0		
4-14	24	9	15	2	2		22	7	15	0			0		
4-15	44	22	22	6	6		34	16	18	0			4		4
4-16	20	6	14	3	3		17	3	14	0			0		
4-18	30	9	21	0			30	9	21	0			0		
4-19	11	5	6	1	1		9	4	5	1		1	0		
4-20	17	11	6	5	5		8	6	2	0			4		4
4-21	24	8	16	2	1	1	22	7	15	0			0		
4-22	16	8	8	1	1		11	7	4	0			4		4
4-23	14	9	5	1	1		13	8	5	0			0		
4-25	16	7	9	0			16	7	9	0			0		
4-26	4	2	2	1	1		1	1		0			2		2
4-27	6	5	1	2	2		4	3	1	0			0		
4-28	6	3	3	1	1		5	2	3	0			0		
4-29	4	4	0	0			4	4		0			0		
4-30	8	1	7	0			8	1	7	0			0		
APR	796	277	519	37	35	2	663	219	464	2	1	1	74	22	52
5-01	3	1	2	0			3	1	2	0			0		
5-03	4	1	3	0			4	1	3	0			0		
5-04	3	3	0	0			3	3		0			0		
5-11	22	8	14	1	1		17	5	12	0			4	2	2
5-12	5	2	3	0			4	2	2	1		1	0		
5-13	2	0	2	0			2		2	0			0		
5-14	1	0	1	0			1		1	0			0		
5-17	4	1	0	1	2		2		2	0			0		
5-19	1	0	1	0			1		1	0			0		
5-20	1	0	1	0	1		0			0			0		
5-21	1	0	1	0			1		1	0			0		
5-23	1						1		1	0			0		
5-28							1		1	0			0		
MAY	49	18	31	4	4	0	40	12	28	1	0	1	4	2	2
TOTAL	1913	616	1297	72	69	3	1528	370	1158	93	85	8	220	92	128

Table 4. 1993 Spring Chinook Return Disposition.

DATE	TRAPPED			SACRIFICED			RELEASED @DAM			RELEASEDUPSTREAM		
	TOTAL	ADULTS	JACKS	TOTAL	ADULTS	JACKS	TOTAL	ADULTS	JACKS	TOTAL	ADULTS	JACKS
4-19	1	1	0	0			0			1	1	
4-21	1	1	0	0			0			1	1	
4-22	4	4	0	0			1	1		3	3	
4-23	7	7	0	4	4		0			3	3	
4-25	16	16	0	0			0			16	16	
4-27	15	15	0	10	10		1	1		4	4	
4-28	12	12	0	a	8		0			4	4	
4-29	17	17	0	10	10		0			7	7	
4-30	22	22	0	a	8		0			14	14	
APR	95	95	0	40	40	0	2	2	0	53	53	0
5-01	21	21	0	0			0			21	21	
5-03	34	34	0	0			2	2		32	32	
5-04	15	14		10	9	1	0			5	5	
5-11	57	57	0	9	9		0			48	48	
5-12	121	121	0	27	27		2	2		92	92	
5-13	90	89	1	13	12	1	0			77	77	
5-14	101	98	3	19	16	3	2	2		80	80	
5-15	88	88	0	1	1		0			87	87	
5-16	129	129	0	0			0			129	129	
5-17	37	34	3	9	6	3	0			28	28	
5-18	31	31	0	8	8		0			23	23	
5-19	27	26		7	6	1	1	1		19	19	
5-20	21	21	0	3	3		0			18	18	
5-21	32	31	1	1		1	0			31	31	
5-22	14	14	0	1	1		0			13	13	
5-23	15	15	0	0			0			15	15	
5-24	6	6	0	0			0			6	6	
5-25	3	3	0	0			0			3	3	
5-26	6	6	0	0			0			6	6	
5-27	15	14		4	3	1	0			11	11	
5-28	25	25	0	0			0			25	25	
5-29	17	17	0	0			0			17	17	
5-31	53	52	1	1	1		0			52	51	1
MAY	958	946	12	113	102	11	7	7	0	838	837	1
6-01	19	17	2	4	4		0			15	13	2
6-02	16	16	0	1	1		0			15	15	
6-03	48	48	0	1	1		0			47	47	
6-04	11	11	0	0			0			11	11	
6-05	a	8	0	0			0			8	8	
6-06	15	15	0	0			0			15	15	
6-08	13	13	0	3	3		0			10	10	
6-10	5	4		1		1	0			4	4	
6-11	4	4	0	0			0			4	4	
6-13	16	15		0			0			16	15	1
6-15	3	3	0	1	1		0			2	2	
6-21			0	0			0			1	1	
6-24	2	2	0	0			0			2	2	
6-28	3	3	0	0			0			3	3	
JUN	164	160	4	11	10	1	0	0	0	153	150	3
7-02	1	1	0	1	1		0			0		
7-06	1	1	0	0			0			1	1	
7-14	2	2	0	0			0			2	2	
JUL	4	4	0	1	1	0	0	0	0	3	3	0
TOTAL	1221	1205	16	165	153	12	9	9	0	1047	1043	4

Westland Canal switched from winter recharge operations to irrigation delivery on April 21. River flow levels were high enough to continue operation of the ladder and bypass for downstream migration until May 24. On May 24, the adult ladder and juvenile bypass were closed and the entire river flow diverted into the canal for the purpose of blocking all downstream migrants at Westland. It was anticipated that flows would not be adequate to allow fall and spring chinook juveniles to migrate naturally below Westland Canal and that either outmigration flow levels would need to be enhanced with water from McKay Reservoir or fish would need to be trapped and hauled.

Fall chinook juveniles began arriving in large numbers at Westland on May 26. River flows were at a level that allowed the ladder and bypass to be re-opened and the fish to migrate on their own. Some fish were diverted into the trap on the morning of May 26 and these were flushed directly back to the river.

On May 28, river levels dropped to a point where water was needed from McKay Reservoir to enhance downstream migration flows. Water was released at a rate of 100 cfs through June 1. Additional precipitation in early June increased flows and precluded the need to trap juvenile spring chinook released in early June. Flows dropped to a level that required trapping on June 14 and the ladder and bypass were closed for the rest of the season.

Because of excellent flow conditions during the spring juvenile migration period, low numbers of juvenile salmonids were captured at the Westland facility. Small numbers of non-game and warmwater fish were also collected at Westland, including northern squawfish, chiselmouth, large scale sucker, bridgelip sucker, redbelly shiner (Richardsonius balteatus), yellow perch (Perca flavescens), and brown bullhead (Ictalurus nebulosus).

The Threemile Dam west bank juvenile bypass was not operated during the fall. It opened April 7, 1993 in conjunction with WEID irrigation. operations. It was operated, with one exception, in the 25 cfs mode until June 16. The facility was operated in the 5 cfs mode from April 12 to 18 for juvenile passage evaluation and from June 16 until July 26 when it was closed for the season.

Transportation Equipment and Operations

Of fish trapped at Threemile Dam, 1,528 summer steelhead; 38 adult and two jack fall chinook; 280 adult and 26 jack coho; and 1043 adult and four jack spring chinook were hauled upstream. There were also 220 summer steelhead and 199 adult and 11 jack fall chinook hauled for brood. Fish were transported from Threemile Dam a total of 152 times on 132 days. The 3,000 gallon liberation unit was used for 71 trips, including 13 double release site trips, and one of the 370 gallon units was used for 80 trips. A 3,500 gallon tanker was also used for one trip.

Six upriver release sites were used during the 1991-92 season; Nolin (PM 33), Barnhart (RM 42), Mission (RM 60), Thornhollow (RM 73.5), Fred Gray's (PM 80) and Bear Creek (PM 87). Barnhart was the major release site used this year. Most all the fall chinook, coho, and summer steelhead were released there. Almost half the spring chinook were also released at Barnhart with the rest being released at the upper four sites. There were also 93 summer steelhead, 47 fall chinook jacks, 62 adult and 142 jack coho, and nine spring chinook adults released into the forebay at Threemile Dam. Table 5 includes release locations and numbers by species:

Adult hauling information, including dates, temperatures, liberation units used and release sites are included in Appendix B.

Summer steelhead adults were hauled upstream from Threemile Dam 85 days between October 23, 1992 and May 28, 1993 and 23 trips were made to the Minthorn holding pond with broodstock between November 23 and May 11. Fish were released at Threemile Dam on 28 days between December 15 and May 12.

Fall chinook were hauled upstream from Threemile Dam nine days between October 30 and December 1, 1992 and 13 trips were made to the Minthorn holding pond with broodstock between October 27 and November 17. Fish were released at Threemile Dam on nine days between October 23 and November 16.

Coho were hauled upstream from Threemile Dam 28 days between October 23 and December 30, 1992. Fish were released at Threemile Dam on 27 days between October 23 and December 28.

Spring chinook were hauled upstream from Threemile Dam 48 days between April 19 and July 14, 1993. Fish were released at Threemile Dam on six days between April 22 and May 19.

From mid to late May, a total of eight adult spring chinook mortalities were observed during unloading. There were also delayed mortalities observed during this same period in areas downstream of the release sites. Other than this period, fish condition at release generally appeared good. Only one summer steelhead and no adult fall chinook or coho mortalities were observed. Appendix C contains the adult transport mortality data.

Only one known summer steelhead kelt was hauled from Westland this year. Steelhead kelts were able to volitionally migrate during good spring flow conditions. There were also three spring- chinook adults trapped at Westland. Two fish were hauled upstream and released above Pendleton and the other was a mortality.

Juveniles were hauled from Westland 25 days between June 15 and July 30, 1993. Because of excellent flows during the Spring outmigration period only an estimated 3,228 pounds of fish were hauled in 25 trips from Westland to the Umatilla River boat ramp

Table 5. Number of trips and adult fish hauled to each release site on the Umatilla River in 1992-93.

Release Site	Total Trips Made	Total Fish Released	Summer Steelhead Released	Spring Chinook Released	Fall Chinook Released	Coho Released
Nolin	9	132	132	0	0	0
Barn hart	89	2231	1390	495	40	306
Mission	1	1	0	1	0	0
Thornhollow	11	119	0	119	0	0
Fred Gray's	13	373	5	368	0	0
Bear Ck.	6	65	1	64	0	0
Minthom Brood Pond	36	436	220	0	210	0
Total	165	3351	1748	1047	2 5 0	306

(RM 0.5) Based on species composition sampling conducted by Bonifer/Minthorn personnel, approximately 89% of the fish transported from Westland were juvenile salmonids. Species composition information is included in Table 6. Juvenile hauling mortality was substantial during late June due to a combination of high water temperatures and excessive turbidity. Juvenile hauling information is located in Appendix D.

No juvenile salmonids were trapped and hauled from the Threemile Dam west bank juvenile facility this year. Phase I exchange flows allowed the facility to be operated in a bypass mode until closure on July 26.

Table 6. Species composition of fish sampled at Westland juvenile facility in 1993.

Date	Total N o. Fish Sampled	Number Per Pound	Hatchery Production			Natural and Unknown Production				Van-game and Warmwater Species
			Coho	Chinook	Summer Steelhead	Coho	Chinook	Summer Steelhead	Bull Trout	
6/15	360	46.5	0	359	0	0	1	0	0	0
6/18	344	38.8	0	339	0	0	0	0	1	4
6/22	278	41.2	0	276	0	0	1	0	0	1
6/25	233	36.6	0	221	1	0	4	0	0	7
7/14	209	14.9	0	18	1	0	2	0	0	188
Total	1424	- - -	0	1213	2	0	a	0	1	200

DISCUSSION

Monitoring

There were questions again this year as to 'the accuracy of OWRD flow data as well as some of the initial information from the BR Hydromet system. This was a bigger concern last year as accurate flow information on which to base operational decisions is much more critical during low flow years than high flow years such as 1993. The Hydromet system is to be completed this summer and the gauge station rating curves should be sufficiently developed to provide the accuracy of flow data needed for future operations. Beginning next project year, all operational flow information will come from the Hydromet gauges.

Migration criteria for both adult and juvenile salmonids are based on the 1981 U.S. Fish and Wildlife report that identifies 150 cfs as the critical flow level for passage through the lower 30 miles of the Umatilla River. This figure needs to be reevaluated as flood events over the past three years have radically changed the channel configuration in this reach.

The Hydromet system is also being equipped to record temperature data at various gauging stations. The temperature data from the Hydromet system will provide a more complete temperature profile of the lower river for establishing operational guidelines.

Weekly inspections of lower Umatilla River adult passage facilities revealed mechanical operation problems and inadequate ladder access and exit conditions. Mechanical problems with the ladder gates, primarily at Stanfield and Westland ladders, did not allow them to be operated within National Marine Fisheries Service (NMFS) criteria and precluded cleaning of the trashracks and attraction flow screens.

At Westland, the hydraulic system for operating the entrance and weir gates was inoperable the entire year. There were also mechanical problems with the gates at the Stanfield ladder. The electric gate motors did not operate correctly initially and the low flow gate jammed in the full open position. These mechanical problems need more timely corrective action so ladders can be operated and maintained as designed.

Spring floods deposited large amounts of gravel in and around the ladders at Stanfield, Cold Springs, and Westland creating poor access and exit conditions, and possibly, passage barriers. At Stanfield a large mound of gravel was deposited in front of the high flow entrance gate and NMFS recommended that it not be operated. At Cold Springs, high water changed the channel configuration below the dam and blocked access to the fish ladder entrance. Spring chinook were observed below the dam attempting to

jump it. There were also large gravel depositions at the fishway exits at both Westland and Cold Springs ladders. Attempts were made to remove these deposits but removal is difficult except during low flow conditions. All the ladders in the system were completely frozen for a two week period in January.

The Brownell diversion dam fishway was a major passage concern this year. Debris has a tendency to plug the fishway effectively blocking fish passage in low water situations. The fishway is located mid stream and is difficult to keep open. This ditch is now being supplied through Phase I and we recommend that the existing diversion dam structure be either modified or removed.

Monitoring of juvenile screen sites and bypasses identified the same two juvenile passage concerns found last year: 1) poor bypass conditions and 2) ineffective screening. Bypass exit conditions at some of the smaller diversions are questionable and one diversion has no bypass or trap. The concern last year with diversion screens not being in place at the beginning of irrigation season was corrected this year.

The Westland bypass was severely impacted by gravel deposition and channel braiding. The bypass had to be excavated three times this year and bypass conditions were generally unfavorable most of the spring. The temporary bypass outfall for the new Stanfield screen site also had to be excavated after the May flooding.

The Cold Springs Canal forebay elevation is not being operated at criteria levels. The location of the canal gauging station prevents the canal from being checked to the correct elevations without impacting gauge ratings. This has resulted in excessive velocities being observed at the drum screens and improper flows in the bypass downwell. The Umatilla TWG is discussing options to remedy this problem including the movement of the gauging station to a site below the forebay check structure.

There is still a major problem at the West Wilson diversion regarding the size of the drum screen. The screen is undersized and the screen needs to be pulled out in order to divert the needed amount of water. The diversion was in operation this year during the peak fall chinook outmigration and both juvenile fall chinook and summer steelhead were observed in the ditch and field. An alternative supply source (Wilson ditch, Stanfield Canal) or larger capacity screen facility needs to be developed at this site.

There is still a question as to whether the "3L" pumps located in the lower Umatilla River (adjacent to the WEID pumps) are properly screened. An inspection of these pumps is needed prior to next year's smolt migration season.

WEID has now signed a conjunctive use agreement with BR to use Phase I to supply additional irrigation water so they should no longer need to operate their lower river pumps.

Adult Trapping Facilities and Operations

The Threemile Dam east bank adult facility performed satisfactorily during the 1992-93 season. The problem identified the last two years with supply pumps stopping during low water has been eliminated now that Phase I is operating and WEID is not diverting water from the Threemile Dam forebay. However, the pumps seem to have lost capacity and need to be serviced for next year.

The Threemile Dam adult facilities were not opened this year until October 23 due to extremely low flows below Threemile Dam. Flows did not exceed 2 cfs until October 14. The Phase I exchange project was initially scheduled to start last fall but was not finished. It began operation in the spring of 1993. The Phase I project will exchange water with WEID whenever they are diverting and resulting stream flows would be less than 250 cfs. This will provide natural stream flows below Threemile Dam on a year round basis and allow the ladder to be operated whenever needed.

Most of the collection facility improvements at Threemile Dam identified last year have been completed with the exception of the anesthetic tank system. The basket and lift system do not meet operational needs and have been identified for modification prior to next season.

During spring high flow conditions large amounts of debris became lodged on the dam and in the ladder approach steps below the dam. Debris plugged the passage openings in the steps causing a passage impediment during low flow conditions. BR crews had to remove debris from the steps on two separate occasions.

The west bank adult ladder and trap was operated by CTUIR Adult Passage Evaluation personnel for a five-day period. A total of 117 summer steelhead were collected during the evaluation period; 17 in the west bank trap and 100 in the east bank trap. The evaluation continues to re-identify the same problems with the west bank collection facilities as were found the previous two years. Trap and Haul operations will continue to take place exclusively at the east bank unless the east bank facility becomes inoperable.

Juvenile Trapping Facilities and Operations

The principal operational problem at the Westland juvenile collection facility this year was maintaining the integrity of the bypass outfall.

Gravel accumulation and channel braiding during high flow conditions both impacted the facility bypass outfall this year. The

outfall was excavated on three different occasions and a rock weir was installed to help keep the bypass open. These attempts all met with limited success. Excavation of the outfall during high flows is a marginal fix as typically it does not completely open the pipe. The rock weir was buried during the first high water after installation. Gravel accumulation at the pipe opening creates less than desirable bypass exit conditions, Fish that go through the bypass are upwelled into shallow water causing disorientation, and possibly injury, and making them highly susceptible to predation.

The May flooding also changed the channel configuration in the area around the bypass and the main channel is now located some distance behind the outfall. It was decided by the Umatilla Technical Work Group (TWG) that BR would relocate the outfall back to the stream bank from its current mid-river location some time this summer.

It was suggested by NMFS that at high flows the bypass weir be completely opened to allow more flow out the bypass pipe to assist in keeping the outfall open. This appeared to help the bypass situation but caused another operational problem. When the bypass was operated in this manner the bypass and flap box sumps were both submerged forcing air and fish into the flap box sump. This allowed both adults and juveniles continual access to the flap box sump, pumpback bay, and pumps. Juveniles were observed being pumped into the canal and a limited number were recovered from the pumpback bay. In addition, one summer steelhead adult and two spring chinook adults were recovered from the pumpback bay and two spring chinook adults were recovered from the flap box sump. This problem was reduced when the bypass weir was operated under the original criteria and the sumps were not submerged. However, fish have accessed the pumpback bay through this route in past years whenever water discharges through the flap box sump. The pumpback bay overflow boards need to be sealed and the flap box sump needs to be screened to preclude fish from accessing the pumpback bay.

Fluctuating canal water levels were experienced again this year. The bypass was inoperable on numerous occasions during winter recharge operations because the canal elevation was too low. Low canal elevations were also encountered during trapping operations. The automated headgate system has been adjusted to where it can now maintain the forebay elevation within the designed operating range but the system is being operated manually rather than automatically on a regular basis.

This year, when we had SWID divert the entire river (-350 cfs), excessive approach velocities were observed at the drum screens which resulted in fall chinook juveniles being rolled over into the canal. The operating criteria of the canal is designed for flows of approximately 250 cfs. If this excess 100 cfs of water is taken into the canal, excessive approach velocities may be experienced over a few days until the river flow drops to 250 cfs.

If the excess water is not diverted, juveniles will continue to migrate past Westland Dam into unfavorable flow conditions which may preclude passage. This operational issue needs to be **discussed** by the Umatilla TWG.

Trapping at Westland began on June 14 but water continued to **spill** the dam until July 2. Consequently, fish continued to pass below Westland Dam into low flow conditions when it was desired **that** they be trapped and hauled.

High water temperatures **at** Westland were **a** concern again this year. Even **with cool**, wet spring and summer climate conditions daily temperatures exceeding 75 F were still recorded. High temperatures reduce our ability to trap and hold fish. An attempt is made not to handle, trap or haul juveniles when temperatures exceed 70 F to minimize temperature related stress and mortality.

In mid June, Stanfield Canal broke creating high turbidity conditions in the lower river. The high turbidity, in conjunction with temperatures up to 77 F, caused juvenile salmonid mortality in the river between Stanfield and Westland canals. Dead and dying juveniles were observed in both the river and canal. From June 19 to June 30, an estimated 6,700 out of **a** total of 75,000 juvenile salmonids trapped (8.9%) at Westland were dead prior to loading. Excessive losses of these fish were also experienced during transport and at release.

Additional management decisions regarding the use of the Westland trapping facility prior to Phase II being implemented need to be made. It is apparent even in good flow and weather years that high water temperatures will be a problem at Westland. Poor environmental conditions and **limited** trapping capacity restrict the number of smolts that can be effectively transported from this facility. The number of smolts encountered during peak juvenile outmigrations exceeds the capabilities of the facility and efforts should be made to supply the water needed to allow these fish to migrate volitionally.

Most items identified for improvement last year at Westland were addressed including a supplementary water supply plumbed off the existing submersible sump pump.

Implementation of Phase I this spring eliminated the problems with low forebay levels experienced in past years at the Threemile Dam west bank juvenile facility. With the Phase I exchange, enough **water** remains in the river below Threemile Dam that the west bank juvenile facility can be operated in a bypass mode the entire season and no trapping should be required except for research purposes.

Transportation Equipment and Operations

Project hauling equipment was generally adequate for adult transport needs in 1992-93. The small exit ports on the trailers still require us to use the 3,000 gallon tanker to haul chinook.

The lower river adult release sites were not adequate this year. Barnhart was the only useable site for most of the year and access was poor during snow and high water. The Nolin release site had to be relocated upstream. It was only accessible with the trailers and just for a short time before it became unuseable. Two of the three upriver locations have developed release sites and access was not a problem. Similar permanent, developed release sites are needed in the lower river to alleviate the continued logistical problems associated with adult releases.

After December 1, summer steelhead adult release criteria called for fish to be released at Threemile Dam if flows of over 150 cfs were anticipated for the subsequent 30 days. Because of low early season returns the decision was made between ODFW and CTUIR that only hatchery origin steelhead would be released at Threemile Dam if the criteria was met and all naturally produced steelhead would be hauled above Stanfield Dam. Releases at Threemile Dam were discontinued on March 15 in anticipation of irrigation season beginning in mid April. Spring rains reduced irrigation withdrawals and maintained river flows at criteria levels until mid May. Radio telemetry data being collected by CTUIR Passage Evaluation personnel should help refine adult release criteria.

Spring chinook adult release criteria called for fish to be released below Pendleton until either May 15 or flows dropped below 150 cfs. Flows remained above 150 cfs throughout the spring and adults were transported to Barnhart through May 15 and then hauled to three release sites in the upper river beginning May 16.

All fish released above Pendleton were marked (right opercle) to differentiate upriver and downriver release locations so the impact of release location on fallback and prespawn mortality rates can be determined. Data will not be available until after spawning season and will be included in the CTUIR Passage Evaluation report.

It has been suspected in past years that a large number of the spring chinook released at Barnhart and Nolin fall back below Stanfield Dam and are unable to migrate back upstream to adequate holding and spawning areas. This year, adults have been observed in Westland Canal, in the Westland juvenile facility, below Westland Dam, below Cold Springs Dam, at various other water diversions in the lower river, and two confirmed fallbacks from the upper river were recaptured in the Threemile Dam east bank trap. Preliminary mark information shows that fish released both above and below Pendleton are falling back.

In mid May, adult spring chinook mortalities were observed at release on three separate occasions. A total of eight were counted at release but delayed mortality reports in areas downstream of the release sites suggest that the mortality was higher. A combination of marginal temperature differentials (-10 F) and large loads apparently contributed to this mortality.

Adults returning to Threemile Dam continue to be anesthetized with carbon dioxide (CO₂). Electro-anesthesia was looked into this year as a possible alternative to CO₂. In a hatchery environment, it appears that electro-anesthesia is quicker and less stressful to the fish. However, concerns have been raised about the use of electro-anesthesia in a multiple species, river run situation and its post release impacts. Until more information is available, CO₂ will continue to be used at Threemile Dam.

A Pescalator fish pump was purchased for Westland to replace the Neilsen fish pump used in previous years. The Pescalator is designed to be easier on fish by transporting them with an auger arrangement in unpressurized compartments where they remain in water the whole time. However, the Pescalator was ineffective in loading production numbers of fish. Fish do not enter the mouth of the unit volitionally and need to be forced into the unit which eliminates the advantage of reduced handling stress to the fish. In one test, it took two hours to load approximately 500 pounds of fish and an estimated 200 pounds still remained in the pond that had to be netted. In two other tests, with smaller numbers of fish, no fish could be effectively loaded with the unit. Further testing of the unit is needed to see if it can be made to perform satisfactorily. We recommend that a Neilsen pump be stationed again at Westland next year in case we continue to experience loading problems with the Pescalator.

Juveniles trapped and hauled from Westland were to be released at the Umatilla River boat ramp (RM 0.5) unless flows dropped below 50 cfs. With the Phase I exchange program, late spring and early summer flows remained above this level. However, adverse release temperatures were noted again this year with temperatures over 70 F being recorded at the Umatilla River boat ramp. Fish were hauled and released during morning hours to minimize exposure to high temperatures.

Even if peak juvenile outmigrations are bypassed at Westland, Trap and Haul operations will continue to take place during the downside of the outmigration in early summer. This means that hauling fish under excessive temperature conditions will become the norm. There is much to be learned about temperature, turbidity, and transport density relationships under river run conditions. We recommend further hauling studies be conducted to evaluate the effects of these relationships and of hauling mixed species groups on fish survival.

References

- Confederated Tribes of the Umatilla Indian Reservation and Oregon Department of Fish & Wildlife (CTUIR & ODFW). 1989. Umatilla Hatchery Master Plan. Submitted to Northwest Power Planning Council, Portland, Oregon.
- Confederated Tribes of the Umatilla Indian Reservation and Oregon Department of Fish & Wildlife (CTUIR & ODFW). 1991. Umatilla Basin Hatchery Fish Production Plan, For the Period September 1991 to August 1992.
- Confederated Tribes of the Umatilla Indian Reservation and Oregon Department of Fish & Wildlife (CTUIR & ODFW). 1990. Columbia Basin System Planning, Umatilla Subbasin, September, 1990. Submitted to Northwest Power Planning Council and Columbia Basin Fish and Wildlife Authority, Portland, Oregon.
- Oregon Department of Fish and Wildlife (ODFW). 1986. A Comprehensive Plan for Rehabilitation of Anadromous Fish Stocks in the Umatilla River Basin. Report to Bonneville Power Administration, Contract No. DE-AI79-84BP18008, Project No. 84-10, Portland, Oregon.
- Schwartzberg and Fryer. 1990. Age and Length Composition of Columbia Basin Spring Chinook Salmon Sampled at Bonneville Dam in 1989. Columbia River Inter-Tribal Fish Commission Technical Report 90-1.
- U.S. Fish and Wildlife Service (USFWS). 1981. Instream Flow Study of the Umatilla River. U.S. Department of the Interior, Fisheries Assistance Office, U.S. Fish & Wildlife Service, Vancouver, Washington.

Appendix A. 1992-93 UMATILLA RIVER WATER PARAMETER DATA

DATE	3MD TEMPS		FLOW @	FLOW @	FLOW @	SFC	c s c	WLC	FLOW @
	C	F	UMATILLA	PNDLTN	YOAKUM	FLWS	FLWS	FLWS	ECHO
16-Sep-92	15.0	59.0	2	45	100	60			40
17-Sep-92	15.3	59.5	1	46	96				96
18-Sep-92	15.8	60.4	1	43	74				74
19-Sep-92	16.7	62.1	1						NA
20-Sep-92	17.8	64.0	1						NA
21-Sep-92	18.9	66.0	1	39	67				67
22-Sep-92	19.3	66.7	1	39	65				65
23-Sep-92	19.4	66.9	1	39	63				63
24-Sep-92	18.5	65.3	1	51	56				56
25-Sep-92	17.2	63.0	1	56	58				58
26-Sep-92	16.8	62.2	1						NA
27-Sep-92	16.3	61.3	1						NA
28-Sep-92	16.1	61.0	1	48	58				58
29-Sep-92	16.0	60.8	1	48	58				58
30-Sep-92	15.5	59.9	1	48	58				58
01-Oct-92	16.4	61.5	1	46	54				54
02-Oct-92	17.0	62.6		45	53				53
03-Oct-92	16.2	61.2							NA
04-Oct-92	16.1	61.0			72				72
05-Oct-92	15.5	59.9		61	67				67
06-Oct-92	14.7	58.5		63	60				60
07-Oct-92	13.8	56.8		59	58				58
08-Oct-92	13.0	55.4		59	56				56
09-Oct-92	13.7	56.7		57	54				54
10-Oct-92	14.2	57.6							NA
11-Oct-92	14.7	58.5	1						NA
12-Oct-92	13.7	56.7	1	56	53				53
13-Oct-92	14.3	57.7		54	53				53
14-Oct-92	13.5	56.3	6	56	51				51
15-Oct-92	12.8	55.0	44	57	53				53
16-Oct-92	11.7	53.1	44	57	56				56
17-Oct-92	11.2	52.2	59						NA
18-Oct-92	11.6	52.9	51						NA
19-Oct-92	12.5	54.5	51	59	56				56
20-Oct-92	13.2	55.8	51	57	56				56
21-Oct-92	14.1	57.4	49	56	53				53
22-Oct-92	13.8	56.8	52	59	58				58
23-Oct-92	13.8	56.8	58	59	56				56
24-Oct-92	13.5	56.3	62						NA
25-Oct-92	13.1	55.6	60						NA
26-Oct-92	12.7	54.9	57	57	54				54
27-Oct-92	12.2	54.0	55	59	54				54
28-Oct-92	11.5	52.7	61	59	54				54
29-Oct-92	11.0	51.8	61	64	60				60
30-Oct-92	11.1	52.0	62	88	69				69
31-Oct-92	11.2	52.2	99						NA

Appendix A. (CONTINUED)

DATE	3MDTEMPS C	F	FLOW @ UMATILLA	FLOW @ PNDLTN	FLOW @ YOAKUM	SFC FLOWS	c s c FLOWS	WLC FLOW @ FLOWS'	ECHO
01-Nov-92	11.4	52.5	146	114	110				110
02-Nov-92	11.5	52.7	1%	108	113				113
03-Nov-92	10.7	51.3	168	99	110				110
04-Nov-92	10.2	50.4	171	102	108				108
05-Nov-92	10.4	50.7	166	99	120				120
06-Nov-92	10.2	50.4	162						NA
07-Nov-92	10.6	51.1	165						NA
08-Nov-92	10.3	50.5	167						NA
09-Nov-92	9.3	48.7	182	192	169		54		115
10-Nov-92	8.1	46.6	268	212	281		119		162
11-Nov-92	7.1	44.8	224	186	281		150		131
12-Nov-92	7.9	46.2	181	162	264		160		104
13-Nov-92	8.8	47.8	150	157	253		166		87
14-Nov-92	9.6	49.3	130	162	175		146		29
15-Nov-92	10.0	50.0	103				146		NA
16-Nov-92	10.1	50.2	94	168	172		146		26
17-Nov-92	9.9	49.8	85	157	167		160		7
18-Nov-92	9.6	49.3	68	152	166		164		2
19-Nov-92	9.2	48.6	75	147	156		150		6
20-Nov-92	8.5	47.3	64	162	166		154		12
21-Nov-92	7.9	46.2	69						NA
22-Nov-92	8.2	46.8	72						NA
23-Nov-92	8.0	46.4	347	685	617		174		443
24-Nov-92	5.4	41.7	516	425	429		168		261
25-Nov-92	4.3	39.7	271	331	337		188		149
26-Nov-92	4.6	40.3	201				186		NA
27-Nov-92	4.7	40.5	167	242	241		190		51
28-Nov-92	5.1	41.2	126						NA
29-Nov-92	5.5	41.9	137						NA
30-Nov-92	5.9	42.6	187	307	302		215		87
01-Dec-92	5.6	42.1	164	307	289		210		79
02-Dec-92	5.5	41.9	165	315	297		215		82
03-Dec-92	4.1	39.4	164	299	289		210		79
04-Dec-92	2.9	37.2	192	263	272		32		240
05-Dec-92	2.1	35.8	343				28		NA
06-Dec-92	1.5	34.7	301				26		NA
07-Dec-92	1.5	34.7	299	219	256		32		224
08-Dec-92	1.5	34.7	285	205	237				237
09-Dec-92	2.2	36.0	301	219	241		32		209
10-Dec-92	3.5	38.3	274	198	234		122		112
11-Dec-92	3.8	38.8	249	227	237		52		185
12-Dec-92	4.3	39.7	275				104		NA
13-Dec-92	4.4	39.9	223				124		NA
14-Dec-92	4.8	40.6	165	250	272		174		98
15-Dec-92	5.0	41.0	140	375	293		208		85
16-Dec-92	4.5	40.1	289	505	461		205		256
17-Dec-92	3.9	39.0	344	458	461		200		261
18-Dec-92	3.6	38.5	307	425	434		208		226
19-Dec-92	2.7	36.9	265				208		NA
20-Dec-92	3.2	37.8	230				210		NA
21-Dec-92	4.3	39.7	219	323	351		210		141
22-Dec-92	5.4	41.7	187	315	332		208		124
23-Dec-92	6.0	42.8	177	340	328		205		123
24-Dec-92	6.2	43.2	236	469	434		200		234
25-Dec-92	5.2	41.4	329				200		NA
26-Dec-92	4.9	40.8	309				198		NA
27-Dec-92	5.4	41.7	312				198		NA
28-Dec-92	5.1	41.2	331	425	429		200		229
29-Dec-92	3.8	38.8	304	414	413		200		213
30-Dec-92	2.7	36.9	301	385	404		131		273
31-Dec-92	1.8	35.2	370	348	369		52		317

Appendix A. (CONTINUED)

DATE	3MD TEMPS		FLOW @	FLOW @	FLOW @	SFC	CSC	WLC	FLOW @
	C	F	UMATILLA	PNDLTN	YOAKUM	FLows	FLows	FLows	ECHO
01-Jan-93	1.5	34.7	417				27		NA
02-Jan-93	1.5	34.7	448				17		NA
03-Jan-93	1.2	34.2	389				23		NA
04-Jan-93	1.5	34.7	381	284	289		23		266
05-Jan-93	1.6	34.9	370	257	285		23		262
06-Jan-93	0.6	33.1	352	234	276		0		276
07-Jan-93	0.2	32.4	352	234	276		0		276
08-Jan-93	0.1	32.2	352	234	272		0		272
09-Jan-93	0.1	32.2	352				0		NA
10-Jan-93	0.0	32.0	352				0		NA
11-Jan-93	0.2	32.4	352	234	272		0		272
12-Jan-93	0.2	32.4	356	234	272		0		272
13-Jan-93	-0.1	31.8	359	234	272		0		272
14-Jan-93	0.0	32.0	359				0		NA
15-Jan-93	0.1	32.2	359				0		NA
16-Jan-93	0.4	32.7	359				0		NA
17-Jan-93	0.4	32.7	359				0		NA
18-Jan-93	0.8	33.4	359				0		NA
19-Jan-93	0.8	33.4	359	234	272		0		272
20-Jan-93	1.2	34.2	396	1062	272		0		272
21-Jan-93	0.7	33.3	1212	1013	748		0		748
22-Jan-93	0.7	33.3	1565	618	568		0		568
23-Jan-93	0.6	33.1	1408				0		NA
24-Jan-93	1.8	35.2	1014				0		NA
25-Jan-93	3.3	37.9	802	573	563		0		563
26-Jan-93	5.4	41.7	991	967	950		0		950
27-Jan-93	4.5	40.1	967	796	774		50		724
28-Jan-93	4.5	40.1	806	702	667		49		618
29-Jan-93	5.0	41.0	758	651	629		48		581
30-Jan-93	5.2	41.4	717				49		NA
31-Jan-93	5.3	41.5	689				49		NA
01-Feb-93	5.2	41.4	653	436	522		55		467
02-Feb-93	4.9	40.8	640	405	477		55		422
03-Feb-93	4.5	40.1	717	385	445		54		391
04-Feb-93	4.6	40.3	700	366	419		148		271
05-Feb-93	4.5	40.1	353	340	399		208		191
06-Feb-93	5.1	41.2	264				215		NA
07-Feb-93	5.7	42.3	276				221		NA
08-Feb-93	5.5	41.9	324	425	440		230		210
09-Feb-93	5.9	42.6	361	505	522		221		301
10-Feb-93	6.3	43.3	663	702	617		224		393
11-Feb-93	6.1	43.0	682	739	648		224		424
12-Feb-93	6.6	43.9	616	739	688		224		464
13-Feb-93	6.8	44.2	647						NA
14-Feb-93	6.9	44.4	743						NA
15-Feb-93	5.6	42.1	690				224		NA
16-Feb-93	3.3	37.9	407	493	551		224		327
17-Feb-93	1.4	34.5	523	405	477		49		42E
18-Feb-93	1.2	34.2	670	395	456		46		41c
19-Feb-93	0.9	33.6	523	375	429		46		383
20-Feb-93	2.2	36.0	498				37		NP
21-Feb-93	2.9	37.2	470				33		NP
22-Feb-93	3.2	37.8	422	315	360		62		296
23-Feb-93	3.5	38.3	346	299	341		139		202
24-Feb-93	2.8	37.0	311	307	346				346
25-Feb-93	1.6	34.9	373	257	332				332
26-Feb-93	1.4	34.5	413	250	328				321
27-Feb-93	1.3	34.3	410						NA
28-Feb-93	0.8	33.4	410						NA

Appendix A. (CONTINUED)

DATE	3MD TEMPS		FLOW @ UMATILLA	FLOW @ PNDLTN	FLOW @ YOAKUM	SFC FLOWS	c s c FLOWS	WLC FLOW @ FLOWS	FLOW @ ECHO
	C	F							
01-Mar-93	0.7	33.3	410	242	328				328
02-Mar-93	1.0	33.8	410	250	328				328
03-Mar-93	2.2	36.0	403	219	328		48		280
04-Mar-93	3.4	38.1	370	263	323		48		275
05-Mar-93	5.1	41.2	627	796	706		52		654
06-Mar-93	5.9	42.6	1417				170		NA
07-Mar-93	6.4	43.5	1651				172		NA
08-Mar-93	6.0	42.8	1822	1697	1567				1567
09-Mar-93	6.0	42.8	1717	1484	1453		198		1255
10-Mar-93	5.9	42.6	1446	1278	1279		218		1061
11-Mar-93	6.2	43.2	1320	1368	1307		215		1092
12-Mar-93	5.8	42.4	1077	1249	1307		230		1077
13-Mar-93	6.0	42.8	927				227		NA
14-Mar-93	7.6	45.7	803						NA
15-Mar-93	8.6	47.5	856	1220	1307		239		1068
16-Mar-93	7.6	45.7	1894	2944	2064		221		1843
17-Mar-93	6.4	43.5	2246	2148	1920		23s		1681
18-Mar-93	7.2	45.0	2513	1763	2328		215		2113
19-Mar-93	7.8	46.0	4532	4804	4752		227		4525
20-Mar-93	8.3	46.9	4212				236		NA
21-Mar-93	7.9	46.2	4458				224		NA
22-Mar-93	7.8	46.0	3605	3948	3819		251		3568
23-Mar-93	8.7	47.7	3614	2867	3870		251		3619
24-Mar-93	7.1	44.8	4624	4599	6661		227		6434
25-Mar-93	6.5	43.7	4819	4576	5546		251		5295
26-Mar-93	7.8	46.0	3788	3292	4117		251		3866
27-Mar-93	8.4	47.1	3076				251		NA
28-Mar-93	8.8	47.8	2873						NA
29-Mar-93	8.8	47.8	2687	1138	2750				2750
30-Mar-93	7.8	46.0	2433	990	2367				2367
31-Mar-93	8.7	47.7	2062	880	2167				2167
01-Apr-93			2072	990	2263				2263
02-Apr-93	9.8	49.6	2742	1797	3060				3060
03-Apr-93	9.7	49.5	2707						NA
04-Apr-93	8.6	47.5	3924				172		NA
05-Apr-93	7.5	45.5	3790	3819	4215		172		4043
06-Apr-93	8.0	46.4	2941	1542	3154		215		2939
07-Apr-93	9.1	48.4	2348	1087	2695		230		2465
08-Apr-93	10.1	50.2	2282	1165	2709		230		2479
09-Apr-93	8.8	47.8	2982	3269	3651		227		3424
10-Apr-93	8.7	47.7	3461				236		NA
11-Apr-93	a.2	46.8	3286				230		NA
12-Apr-93	8.4	47.1	3058	1220	3554		236		3318
13-Apr-93	9.1	48.4	2505	1062	2860		230		2630
14-Apr-93	9.0	48.2	2310	945	2777		242		2535
15-Apr-93	10.3	50.5	2149	837	2547		236		2311
16-Apr-93	9.4	48.9	2003	757	2496				2496
17-Apr-93	10.1	50.2	1721				233		NA
18-Apr-93	10.1	50.2	1843				23s		NA
19-Apr-93	10.0	50.0	2052	990	2601		236		2365
20-Apr-93	10.5	50.9	1850	1249	1932		239		1693
21-Apr-93	11.6	52.9	1659	1220	1918		236	124	1558
22-Apr-93	11.8	53.2	1637	1249	1928		236	124	1568
23-Apr-93	10.3	50.5	1644	1278	1887		236	140	1511
24-Apr-93	11.4	52.5	1486					162	NA
25-Apr-93	12.0	53.6	1385			61		162	NA
26-Apr-93	11.6	52.9	1684	1602	2212	61	236	162	1753
27-Apr-93	11.0	51.8	1779	1484	2039	61	23s	186	1553
28-Apr-93	10.6	51.1	1709	1400	2100	61	236	186	1617
29-Apr-93	11.3	52.3	1634	1338	2003	61	236	186	1520
30-Apr-93	11.9	53.4	2378	2620	2874	62	227	186	2399

Appendix A. (CONTINUED)

DATE	3MD TEMPS		FLOW @	FLOW @	FLOW @	SFC	CSC	WLC	FLOW @
	C	F	UMATILLA	PNDLTN	YOAKUM	FLWS	FLWS	FLWS	ECHO
01-May-93	10.5	50.9	3067			60	227	186	NA
02-May-93	11.0	51.8	2773			69	236	186	NA
03-May-93	10.5	50.9	2721	3136	3046	69	239	181	2557
04-May-93	8.8	47.8	3669	6454	7058	51	218	155	6634
05-May-93	9.3	48.7	9170	5720	7446	51	215	109	7071
06-May-93	10.6	51.1	7350	4781	5725	51	218	112	5344
07-May-93	9.5	49.1	4835	4466	5041	51	227	125	4638
08-May-93	10.1	50.2	4142			50	218	130	NA
09-May-93	10.8	51.4	3302			50	215	128	NA
10-May-93	13.3	55.9	2417	1513	2380	49	224	124	1983
11-May-93	15.1	59.2	2071	1697	2405	69	236	161	1939
12-May-93	15.6	60.1	2189	1938	2601	67	230	173	2111
13-May-93	15.8	60.4	1875	1513	2328	118	221	202	1787
14-May-93	15.7	60.3	1426	1307	1851	116	227	220	1288
15-May-93	16.1	61.0	1115			116	236	246	NA
16-May-93	16.4	61.5	845			116	230	250	NA
17-May-93	17.4	63.3	611	720	1095	04	224	246	521
18-May-93	18.5	65.3	453	618	950	10		232	608
19-May-93	19.0	66.2	545	530	852	05		232	515
20-May-93	18.6	65.5	469	493	760	05		239	416
21-May-93	18.3	64.9	388	436	680	05	221	239	115
22-May-93	17.5	63.5	252			03	218	239	NP
23-May-93	18.1	64.6	218			94	212	205	NA
24-May-93	19.0	66.2	179	277	534	81	200	167	86
25-May-93	19.7	67.5	128	415	592	97		218	277
26-May-93	19.1	66.4	241	395	557	100		189	268
27-May-93	19.6	67.3	244	348	522	101		212	209
28-May-93	18.4	65.1	255	340	522	118		215	189
29-May-93	17.4	63.3	278	375	545	118		215	212
30-May-93	18.5	65.3	281	307	494	118		212	164
31-May-93	18.8	65.8	271	284	461	113		189	159
01-Jun-93	17.5	63.5	302	340	534	113		189	232
02-Jun-93	17.0	62.6	421	385	455	98		167	190
03-Jun-93	17.2	63.0	350	385	414	91		167	156
04-Jun-93	17.2	63.0	434	618	654	80		167	407
05-Jun-93	17.7	63.9	474			80		167	NA
06-Jun-93	19.0	66.2	444			74		155	NA
07-Jun-93	17.1	62.8	477	618	673	80		152	441
08-Jun-93	15.1	59.2	495	588	693	75		167	451
09-Jun-93	16.9	62.4	397	530	648	95		167	386
10-Jun-93	17.5	63.5	320	469	592	102		182	308
11-Jun-93	17.2	63.0	278	404	522	110		215	197
12-Jun-93	16.5	61.7	275			122		218	NA
13-Jun-93	17.9	64.2	258			121		215	NA
14-Jun-93	19.9	67.8	209	323	409	118		215	76
15-Jun-93	20.4	68.7	159	292	394	128		222	44
16-Jun-93	19.5	67.1	158	264	429	127		222	80
17-Jun-93	20.8	69.4	141	250	360	140		205	15
18-Jun-93	22.0	71.6	142	263	472	0		225	247
19-Jun-93	22.5	72.5	203			0		225	NP
20-Jun-93	22.5	72.5	123			0		250	NP
21-Jun-93	20.7	69.3	156	168	472	100		250	122
22-Jun-93	17.3	63.1	201	212	477	108		239	130
23-Jun-93	16.4	61.5	181	192	404	109		239	56
24-Jun-93	17.8	64.0	119	174	389	102		239	48
25-Jun-93	19.3	66.7	149	147	369			239	130
26-Jun-93	21.7	71.1	107			98		235	NA
27-Jun-93	21.5	70.7	99			120		233	NA
28-Jun-93	19.7	67.5	91	114	419	123		232	64
29-Jun-93	18.7	65.7	109	111	394	115		229	5c
30-Jun-93	19.6	67.3	95	102	379	116		222	41

ppendix A. (CONTINUED)

DATE	3MD TEMPS C F	FLOW @ UMATILLA	FLOW @ PNDLTN	FLOW @ YOAKU M	SFC FLOWS	c s c FLOWS	WLC FLOWS	FLOW @ ECHO
01-Jul-93	20.4 68.7	79	96	369	127		208	34
02-Jul-93	20.4 68.7	79	93	337	124		188	25
03-Jul-93	19.4 66.9	83			118		216	NA
04-Jul-93	19.8 67.6	79			117		193	NA
05-Jul-93	20.1 68.2	a2			115		184	NA
06-Jul-93	20.1 68.2	78	108	310	116		178	16
07-Jul-93	20.3 68.5	81	105	314	115		171	28
08-Jul-93	20.9 69.6	a7	99	346	109		193	44
09-Jul-93	21.2 70.2	84	96	409	102		210	97
10-Jul-93	20.6 69.1	83			102		224	NA
11-Jul-93	20.2 68.4	91			103		236	NA
12-Jul-93	19.5 67.1	102	86	399	101		237	61
13-Jul-93	19.3 66.7	110	86	374	97		220	57
14-Jul-93	19.7 67.5	111	105	424	95		202	127
15-Jul-93	19.5 67.1	167	96	374	95		199	80
16-Jul-93	19.2 66.6	108	93	345	95		207	43
17-Jul-93	18.7 65.7	105			95		198	NA
18-Jul-93	19.5 67.1	114			98		178	NP
19-Jul-93	20.1 68.2	110	86	297	95		171	31
20-Jul-93	19.5 67.1	117	74	319	92		187	4c
21-Jul-93	19.2 66.6	118			91		185	NP
22-Jul-93	20.2 68.4	126	99	268	91		150	27
23-Jul-93	20.6 69.1	114	83	272	97		128	47
24-Jul-93	20.0 68.0	110			97		144	NP
25-Jul-93	19.4 66.9	114			96		151	NP
26-Jul-93	NA NA	128	96	285	93		146	4E
27-Jul-93	NA NA	122	83	268	91		137	4c
28-Jul-93	NA NA	108	83	272	92		134	46
29-Jul-93	NA NA	100	74	281	94		160	27
30-Jul-93	NA NA	96	72	332	105		185	42
31-Jul-93	NA NA	95			110		192	NA
01-Aug-93	NA NA	104	77	333	115		199	19
02-Aug-93	NA NA	102	73	327	115		208	4
03-Aug-93	NA NA	99	70	316	115		178	23
04-Aug-93	NA NA	104	68	323	114		184	25
05-Aug-93	NA NA	103	63	322	113		185	24
06-Aug-93	NA NA	99	57	334	116		191	27
07-Aug-93	NA NA	98	59	352	121		202	29
08-Aug-93	NA NA	104	57	349	121		203	25
09-Aug-93	NA NA	107	58	339	114		198	27
10-Aug-93	NA NA	114	56	338	107		203	28
11-Aug-93	NA NA	97	54	335	105		199	31
12-Aug-93	NA NA	92	51	329	104		179	46
13-Aug-93	NA NA	102	50	315	02		183	30
14-Aug-93	NA NA	111	50	275	01		175	- 1
15-Aug-93	NA NA	119	53	280	02		195	- 17
16-Aug-93	NA NA	118	343	530	97		168	265
17-Aug-93	NA NA	470	162	297	92		140	65
18-Aug-93	NA NA	199	107	217	86		142	- 11
19-Aug-93	NA NA	127	92	207	a2		149	-24
20-Aug-93	NA NA	111	86	188	81		142	-35
21-Aug-93	NA NA	101	80	173	79		124	-30
22-Aug-93	NA NA	89	77	170	81		114	- 25
23-Aug-93	NA NA	84	71	180	83		124	- 27
24-Aug-93	NA NA	78	72	200	86		142	-213
25-Aug-93	NA NA	80	71	217	83		159	-25
26-Aug-93	19.0 66.2	74	69	223	86		157	-20
27-Aug-93	19.3 66.7	76	66	219	88		156	-25
28-Aug-93	20.3 68.5	78	65	255	87		185	- 17
29-Aug-93	19.7 67.5	a3	64	261	a7		203	-23
30-Aug-93	20.0 68.0	85	59	234	a5		177	-28
31-Aug-93	20.5 68.9	83	62	235	84		166	- 15

Appendix B. 1992-93 THREEMILE DAM ADULT TRANSFORTATION SUMMARY

DATE	LOADING SITE TEMP.	RELEASE SITE TEMP.	NUMBER HAULED	RELEASE SITE	LIBERATION UNIT
10-23	56	55	3	BARNHART	TANKER
10-26	55	53	7	BARNHART	TANKER
10-27	54	54	2	MINTHORN	TANKER
10-29	53	52	1	BARNHART	TANKER
10-30	52	43	5	BARNHART	TANKER
OCTOBER TOTAL			18		
11-2	53	50	26	BARNHART	TANKER
11-2	53	54	28	MINTHORN	TANKER
11-3	50	48	91	BARNHART	TANKER
11-3	50	54	36	MINTHORN	TANKER
11-4	50	47	18	BARNHART	TANKER
11-4	50	54	17	MINTHORN	TANKER
11-5	51	49	13	BARNHART	TANKER
11-5	51	54	16	MINTHORN	TANKER
11-6	50	48	13	BARNHART	TANKER
11-6	50	52	23	MINTHORN	TANKER
11-8	50	48	1	BARNHART	TANKER
11-8	50	52	29	MINTHORN	TANKER
11-9	48	44	24	BARNHART	TANKER
11-9	48	52	28	MINTHORN	TANKER
11-10	45	44	5	BARNHART	TANKER
11-10	45	49	7	MINTHORN	TANKER
11-11	43	48	3	MINTHORN	TANKER
11-13	47	47	24	BARNHART	TANKER
11-13	47	52	9	MINTHORN	TANKER
11-16	50	47	53	BARNHART	TANKER
11-16	50	52	10	MINTHORN	TANKER
11-17	49	45	13	BARNHART	TANKER
11-17	49	51	2	MINTHORN	TANKER
11-18	50	47	8	BARNHART	TANKER
11-19	49	45	7	BARNHART	TANKER
11-20	49	43	8	BARNHART	TANKER
11-23	48	43	3	BARNHART	TANKER
11-23	48	NA	1	MINTHORN	TANKER
11-24	46	44	3	BARNHART	TANKER
11-25	46	43	4	BARNHART	TANKER
11-27	40	29	1	BARNHART	TRAILER
11-30	41	40	3	BARNHART	TRAILER
11-30	41	50	1	MINTHORN	TRAILER
NOVEMBER TOTAL			543		

Appendix B. (continued)

DATE	LOADING SITE TEMP.	RELEASE SITE TEMP.	NUMBER HAULED	RELEASE SITE	LIBERATION UNIT
12-1	42	40	8	BARNHART	TRAILER
12-2	42	39	2	BARNHART	TRAILER
12-14	41	41	1	NOLIN	TRAILER
12-15	41	39	1	BARNHART	TRAILER
12-17	38	37	1	BARNHART	TRAILER
12-18	38	37	1	NOLIN	TRAILER
12-24	43	39	9	BARNHART	TANKER
12-28	41	39	12	BARNHART	TANKER
12-28	41	39	2	MINTHORN	TANKER
12-30	35	34	4	NOLIN	TRAILER
DECEMBER TOTAL			41		
1-25	38	42	1	BARNHART	TRAILER
1-26	41	39	1	BARNHART	TRAILER
1-28	39	38	3	BARNHART	TRAILER
1-29	41	41	4	BARNHART	TRAILER
JANUARY TOTAL			9		
2-1	42	40	62	NOLIN	TRAILER
2-1	40	44	8	MINTHORN	TRAILER
2-2	41	38	8	BARNHART	TRAILER
2-5	39	36	5	BARNHART	TRAILER
2-8	40	38	29	NOLIN	TRAILER
2-9	41	42	17	NOLIN	TRAILER
2-10	43	42	2	NOLIN	TRAILER
2-11	43	43	11	BARNHART	TRAILER
2-11	43	44	4	MINTHORN	TRAILER
2-12	43	42	6	NOLIN	TRAILER
2-14	43	43	5	MINTHORN	TRAILER
2-16	36	34	11	NOLIN	TRAILER
2-19	33	33	1	BARNHART	TRAILER
FEBRUARY TOTAL			169		
3-5	38	42	20	BARNHART	TRAILER
3-5	38	48	1	MINTHORN	TRAILER
3-6	40	40	31	BARNHART	TRAILER
3-8	42	42	15	BARNHART	TRAILER
3-8	42	42	15	MINTHORN	TRAILER
3-9	42	42	5	BARNHART	TRAILER
3-10	41	42	5	BARNHART	TRAILER
3-11	42	42	13	BARNHART	TRAILER
3-12	41	39	9	BARNHART	TRAILER
3-12	41	43	CD	MI I. A	TRAILER

Appendix B. (continued)

DATE	LOADING SITE TEMP.	RELEASE SITE TEMP.	NUMBER HAULED	RELEASE SITE	LIBERATION UNIT
3-14	42	NA	34	BARNHART	TRAILER
3-15	48	44	46	BARNHART	TRAILER
3-15	48	NA	13	MINTHORN	TRAILER
3-16	44	NA	34	BARNHART	TRAILER
3-17	NA	42	39	BARNHART	TRAILER
3-19	46	45	19	BARNHART	TRAILER
3-19	46	42	9	MINTHORN	TRAILER
3-23	49	45	2	7 BARNHART	TRAILER
3-23	49	NA	8	MINTHORN	TRAILER
3-24	45	NA	18	BARNHART	TRAILER
3-29	49	45	140	BARNHART	TANKER
3-29	43	NA	30	MINTHORN	TRAILER
3-30	48	45	93	BARNHART	TANKER
3-30	48	NA	16	MINTHORN	TRAILER
3-31	49	48	54	BARNHART	TANKER
3-31	43	NA	7	MINTHORN	TRAILER
MARCH TOTAL			723		
4-1	48	49	3	BARNHART	TANKER
4-1	48	NA	14	MINTHORN	TRAILER
4-2	50	47	122	BARNHART	TANKER
4-2	50	51	34	MINTHORN	TRAILER
4-3	51	47	0	5 BARNHART	TANKER
4-4	45	NA	32	BARNHART	TRAILER
4-5	45	43	5	BARNHART	TRAILER
4-6	42	NA	11	BARNHART	TRAILER
4-7	50	47	21	BARNHART	TRAILER
4-3	48	46	53	BARNHART	TANKER
4-8	48	NA	12	MINTHORN	TRAILER
4-9	47	45	46	BARNHART	TANKER
4-11	44	NA	18	BARNHART	TRAILER
4-12	44	N	12	A BARNHART	TRAILER
4-13	46	47	26	BARNHART	TRAILER
4-14	NA	NA	22	BARNHART	TRAILER
4-15	50	48	34	BARNHART	TRAILER
4-15	50	48	4	MINTHORN	TRAILER
4-16	49	47	17	BARNHART	TRAILER
4-18	48	49	30	BARNHART	TRAILER
4-19	49	46	10	BARNHART	TRAILER
4-20	50	47	8	BARNHART	TRAILER
4-20	50	50	4	MINTHORN	TRAILER
4-21	50	47	23	BARNHART	TRAILER
4-22	54	47	14	BARNHART	TANKER
4-22	54	N	4	A MINTHGRN	TRAILER
4-23	50	37	16	BARNHART	TRAILER
4-25	50	48	32	BARNHART	TANKER
4-26	50	4	1	BARNHART	TRAILER

Appendix B. (continued)

DATE	LOADING SITE TEMP.	RELEASE SITE TEMP.	NUMBER HAULED	RELEASE SITE	LIBERATION UNIT
4-26	50	48	2	MINTHORN	TRAILER
d-27	51	50	8	BARNHART	TANKER
4-28	51	47	9	BARNHART	TANKER
4-29	51	49	11	BARNHART	TANKER
4-30	51	49	22	BARNHART	TANKER
APRIL TOTAL			810		
5-1	51	NA	24	BARNHART	TANKER
5-3	46	45	36	BARNHART	TANKER
5-d	48	46	8	BARNHART	TANKER
5-11	56	55	65	BARNHART	TANKER
5-11	56	NA	4	MINTHORN	TRAILER
5-12	61	61	96	BARNHART	TANKER
5-13	58	59	79	BARNHART	TANKER
5-14	59	56	81	BARNHART	TANKER
5-15	59	53	89	BARNHART	TANKER
5-16	58	55	129	FRED GRAY	TANKER
5-17	57	56	28	FRED GRAY	TANKER
5-18	59	55	23	THORNHOLLOW	TANKER
5-19	59	55	20	FRED GRAY	TANKER
5-20	65	55	18	THORNHOLLOW	TANKER
5-21	65	53	32	FRED GRAY	TANKER
5-22	63	52	13	THORNHOLLOW	TANKER
h-23	65	55	16	FRED GRAY	TANKER
5-24	66	56	6	THORNHOLLOW	TANKER
5-25	66	60	3	BEAR CREEK	TANKER
5-26	64	60	6	BEAR CREEK	TANKER
5-27	64	54	11	THORNHOLLOW	TANKER
5-29	64	52	26	BEAR CREEK	TANKER
5-29	62	NA	17	THORNHOLLOW	TANKER
5-31	64	48	52	FRED GRAY	TANKER
MAY TOTAL			882		

Appendix B. (continued)

DATE	LOADING SITE TEMP.	RELEASE SITE TEMP.	NUMBER HAULED	RELEASE SITE	LIBERATION UNIT
6-1	58	48	15	BEAR CREEK	TANKER
6-2	59	48	15	THORNHOLLOW	TANKER
6-3	59	46	47	FRED GRAY	TANKER
6-4	62	52	11	BEAR CREEK	TANKER
6-5	61	NA	8	THORNHOLLOW	TANKER
6-6	61	50	15	FRED GRAY	TANKER
6-8	61	NA	10	FRED GRAY	3500 GAL.
6-10	64	54	4	BEAR CREEK	TANKER
6-11	62	54	4	THORNHOLLOW	TANKER
6-13	62	NA	16	FRED GRAY	TANKER
6-15	70	65	2	THORNHOLLOW	TRAILER
6-21	66	66	1	MISSION BR.	TRAILER
6-24	NA	NA	2	THORNHOLLOW	TRAILER
6-28	69	58	3	FRED GRAY	TRAILER
JUNE TOTAL			153		
7-6	69	69	1	FRED GRAY	TRAILER
7-14	68	56	2	FRED GRAY	TRAILER
JULY TOTAL			3		

Appendix C. ADULT TRANSPORTATION MORTALITIES 1992-93

Date	Species	Number Morts	Number Hauled	Loading Temp.	Release Temp.	Release -Site	Liberation Unit	
4-20	STS	1	a	50		BARNHART	T-A-N-K-E-R	46
5-14	CHS	1	81	59	56	BARNHART	TANKER	
5-15	CHS	2	89	59	53	BARNHART	TANKER	
5-16	CHS	1	129	58	55	BARNHART	TANKER	
5-20	CHS	1	13	63	52	THORNHOLLOW	TANKER	
5-31	CHS	1	52	64	48	FRED GRAY	TANKER	
6-3	CHS	2	47	59	d7	FRED GRAY	TRAILER	
Total		9	419					

Appendix D. WESTLAND JUVENILE TRANSPORTATION SUMMARY

DATE	LOADING SITE TEMP.	RELEASE SITE TEMP.	POUNDS HAULED	RELEASE SITE	LIBERATION UNIT
6-15	65	66	165	URBR	TRAILER
6-16	61	63	168	URBR	TRAILER
6-17	65	73	115	URBR	TRAILER
6-18	68	71	164	URBR	TRAILER
6-20	69	79	550	URBR	TANKER
6-21	67	68	170	URBR	TRAILER
6-21	67	67	165	URER	TRAILER
6-21	67	68	178	URBR	TRAILER
6-22	59	64	160	URBR	TRAILER
6-23	57	62	116	URBR	TRAILER
6-24	59	NA	75	URBR	TRAILER
6-25	64	62	94	URBR	TRAILER
6-28	59	59	165	URBR	TRAILER
6-30	59	64	94	URBR	TRAILER
TOTAL JUNE			2379		
CATE	LOADING SITE TEMP.	RELEASE SITE TEMP.	POUNDS HAULED	RELEASE SITE	LIBERATION UNIT
7-2	63	66	117	URBR	TRAILER
7-6	62	64	70	URBR	TRAILER
7-a	64	69	23	URBR	TRAILER
7-9	64	70	23	URBR	TRAILER
7-12	61	66	47	URBR	TRAILER
7-14	60	66	234	URBR	TRAILER
7-16	63	65	260	URBR	TRAILER
7-19	65	66	30	URBR	TRAILER
7-23	64	68	23	URBR	TRAILER
7-26	64	68	12	URBR	TRAILER
7-29	66	69	10	URBR	TRAILER
TOTAL JULY			a49		